7. Demonstration of Reasonable Progress Goals

7.1 Reasonable Progress Requirements

The Regional Haze Rule requires California to establish goals for the year 2018 that provide for reasonable progress towards achieving natural visibility conditions in 2064 at each of its Class 1 Areas. The Reasonable Progress Goals (RPGs) must be expressed in deciviews and indicate the planned improvement in visibility for the 20 percent most-impaired days (worst days) of the baseline years by 2018. The Plan must also ensure no degradation in visibility for the 20 percent least-impaired days (best days) of the baseline years.

In establishing the RPGs, a state must consider four factors:

1. costs of compliance;
2. time necessary for compliance;
3. energy and non-air quality environmental impacts of compliance; and
4. remaining useful life of any potentially affected sources.

California included a demonstration showing how these factors were taken into consideration in the previous discussion of the 2018 Progress Strategy. The rulemaking process for both ARB and the local air districts in California have embodied consideration of the four factors for decades. Continuous efforts to attain and maintain the federal and State health-based air quality standards are the reason that California feels confident that every reasonable measure is included in the State's 2018 Progress Strategy backing the RPGs.

It is also important to note that the Regional Haze Rule states that the RPGs established by a state are not directly enforceable, but rather will be considered by U.S. EPA in evaluating the adequacy of the measures in the Plan to achieve the progress goal adopted by a state. Specifically, U.S. EPA noted in the Regional Haze Rule that:

> "There are no presumptive targets that states are required to meet to achieve reasonable progress. States have flexibility in determining their reasonable progress goals based on consideration of the statutory factors. However, the final rule requires states to conduct certain analyses to ensure that they consider the possibility of setting an ambitious reasonable progress goal, one that is aimed at reaching natural conditions in 2064."

7.2 Reasonable Progress Goals in California

California has set RPGs for each California Class 1 Areas as shown in Table 7-2. These RPGs are based upon the results of the WRAP modeling scenario described in Chapter 6. While the 2018 scenario that was modeled includes the benefits of control measures adopted by ARB and local air districts, it does not

include possible BART reductions because they were not available at the time of WRAP modeling. However, reductions due to BART expected in California and from upwind states will have minimal effect on haze at the California IMPROVE monitors. These reductions will be included in future regional modeling and progress re-evaluated at the mid-course review.

The projected deciview levels are the modeled results of the phased implementation of California's 2018 Progress Strategy. This strategy represents an ambitious and far-reaching level of control for achieving reductions in the anthropogenic contributions to visibility impairment in California. California's 2018 Progress Strategy for reducing haze has focused on identifying the major drivers of haze on worst days, and determining the primary sources of those species and their precursors. In particular, significant reductions in the nitrate component of haze are predicted due to the extensive NOx emission reductions from California's mobile source control programs. However, evidence from source apportionment analysis showed that not all of the emissions contributing to haze come from anthropogenic sources within California's control. Emissions from natural sources such as wildfires and biogenics, whether from in-State or out-of-State, can contribute significantly to impaired visibility at all Class 1 Areas in California. In addition, visibility impacts are also seen from international sources outside the WRAP states.

Hence, for this first planning period, our focus is on demonstrating the improvements in visibility that will result from California's broad spectrum of control efforts. We believe the RPGs are reasonable for the first planning period considering: (a) California is controlling in-State anthropogenic sources at levels well beyond those achieved through national programs; (b) the 2018 Progress Strategy has embodied the four-factor analysis requirement for decades and is, therefore, reasonable from a western regional perspective; (c) there are significant contributions from sources not included in the WRAP region, and (d) there is uncertainty in the values being reflected in the current natural conditions due to wildfires and biogenics which may underestimate the true natural conditions for the West.

The RPGs displayed in Table 7-2 show that visibility will improve on the worst days and will not deteriorate on the best days by 2018. While visibility is expected to improve in 2018 throughout the West, the greatest gains will be seen in California. Coastal and Southern California Class 1 Areas make the greatest progress. Sites in these regions have large contributions from nitrate and therefore California's mobile source NOx control program provides significant reductions in the nitrate component by 2018. Lesser progress is seen in Northern California and Sierra Nevada Class 1 Areas. While significant reductions in nitrate are also seen at these sites, the continuing impacts of natural fire, biogenics, offshore shipping and other emissions not included in the WRAP region limit the amount of overall progress that can be achieved.

In the following sections we have summarized the role of controllable versus uncontrollable emissions and the benefits of California's control programs for each haze component.

- **Organic carbon** is the primary or secondary driver of worst day haze, in all of the State but Southern California. The WRAP source apportionment analysis suggests that wildfires, biogenics (natural plant, animal, and soil organism emissions), and area sources are the primary contributors to organic carbon constituting from 25 percent to 90 percent on worst days. Biogenic emissions peak during the dry wildfire season, and contribute the most natural organic carbon annually. ARB's emissions inventory indicates the largest category of area source emissions of organic carbon may be winter-time residential wood combustion. Many air districts in California are developing programs to minimize the emissions from this source by requiring use of U.S. EPA certified woodstoves, and instituting voluntary or mandatory no-burn day programs. Stringent ARB controls for mobile sources are also helping to curb both directly emitted PM and volatile organic carbon emissions that contribute to the organic carbon component of visibility impairment.

- **Nitrates** are a key driver of haze at many sites, especially in Southern California and other sites located near major urban areas and transportation corridors. In-State anthropogenic NOx emissions are estimated to account for 7 percent to 86 percent of nitrate contributions to haze at California Class 1 Areas. Reducing this precursor to nitrate formation is a major first step in reducing regional haze. The gradient of least to most influence corresponds directly to the amount of mobile source NOx emissions nearby. Back-trajectory analyses and future conditions modeling indicate that substantial reductions in nitrate, roughly 50 percent at every State Class 1 Area are achievable due to planned mobile source NOx emission reductions.

- **Sulfates** also drive haze at all IMPROVE monitors on some worst days, but the influence is most perceptible along the coast. Offshore and non-WRAP region sources are the largest contributors, accounting for approximately 50 to 75 percent of the measured sulfate levels. In-State anthropogenic emissions are estimated to account for 1 percent to 35 percent. There are very few large SOx sources in California and low sulfur fuel is already required for both mobile and stationary sources. Offshore emissions appear to contribute both natural marine sulfates and SOx from marine commercial shipping activities. California's Goods Movement Program is designed to address many port-related SOx emissions. The feasibility of further SOx reduction measures will be evaluated during the mid-course review.

- **Coarse Mass** does not drive haze on worst days in California, although occasionally it may contribute to a single worst day at some of the drier Class 1 Areas in the Mojave Desert and on the lee side of the Sierra Nevada.

The days with slightly elevated coarse mass are almost always associated with windblown dust events, including transport from Asian dust storms. These wind-driven events also cause very slight elevations in fine soil (PM2.5 fraction of dust), but this species never drives worst days. The 2018 Progress Strategy includes localized dust controls that keep these species at very low concentrations throughout the year.

- **Elemental Carbon** is not a driver of haze on worst days in California. Despite its strong capability to extinguish light, emissions are very low and are not expected to increase. In 2000, California initiated a Diesel Risk Reduction Program that focuses on reducing toxic air contaminants in diesel exhaust, specifically carcinogenic hydrocarbons and soot particles. California has realized benefits from this program as elemental carbon trends at IMPROVE monitors have already shown progress. Future benefits are expected as rules adopted during the baseline period continue their phased implementation. The WRAP modeling has demonstrated significant reductions in the contributions from elemental carbon in 2018 due to California's programs to address on- and off-road mobile sources.

- **Fine soil** is not a driver of haze on worst days. In fact, it contributes the least to haze Statewide. It is less than 1 percent of the annual contribution to light extinction at many IMPROVE monitors on best and worst days, with the highest annual average worst day contribution being just over 5 percent at one isolated IMPROVE monitor (HOOV) in the rain shadow (dryer, lee side) of the Sierra Nevada. On a day-to-day basis, fluctuations in concentration at the IMPROVE monitors are associated with high wind events, including receiving fallout from intercontinental transport after Asian dust storms. Dust control programs to reduce coarse mass also affect fine soil.

7.3 Uniform Rate of Progress

As part of the goal setting process, the Regional Haze Rule requires states to assess a linear path towards natural conditions for each Class 1 Area. This linear path is termed the Uniform Rate of Progress (URP). It represents a uniform rate of deciview reduction if haze levels on the worst days decreased the same number of deciviews per year over 60 years beginning in 2004 and ending at natural conditions in 2064. This can also be expressed as the glide path or slope of the line between 2004 and 2064. Figure 7-1 illustrates these concepts. States must compare their RPGs to the level that would be achieved in 2018 if progress were to follow this linear glide path. The URP is not a regulatory goal or standard but merely a benchmark, against which progress towards natural conditions can be evaluated.

If a state establishes RPGs for 2018 that result in a slower rate of visibility improvement than the glide path, a state must demonstrate how the selected RPG and the consequent rate of progress are reasonable. A state must also

provide an assessment of the number of years it would take to achieve Natural Conditions if improvement continues at the rate different from the uniform rate of progress. Using Sequoia National Park as an example, Figure 7-2 shows a possible alternative path to Natural Conditions if the slope to reach the selected 2018 RPG (22.7 deciviews) at SEQU is maintained beyond 2018. Figure 7-2 shows that the Natural Conditions worst days (7.7 deciviews) would be reached by 2096, if the rate of progress in future planning periods is the same as in this first planning period.

Figure 7-1 Uniform Rate of Progress Illustration

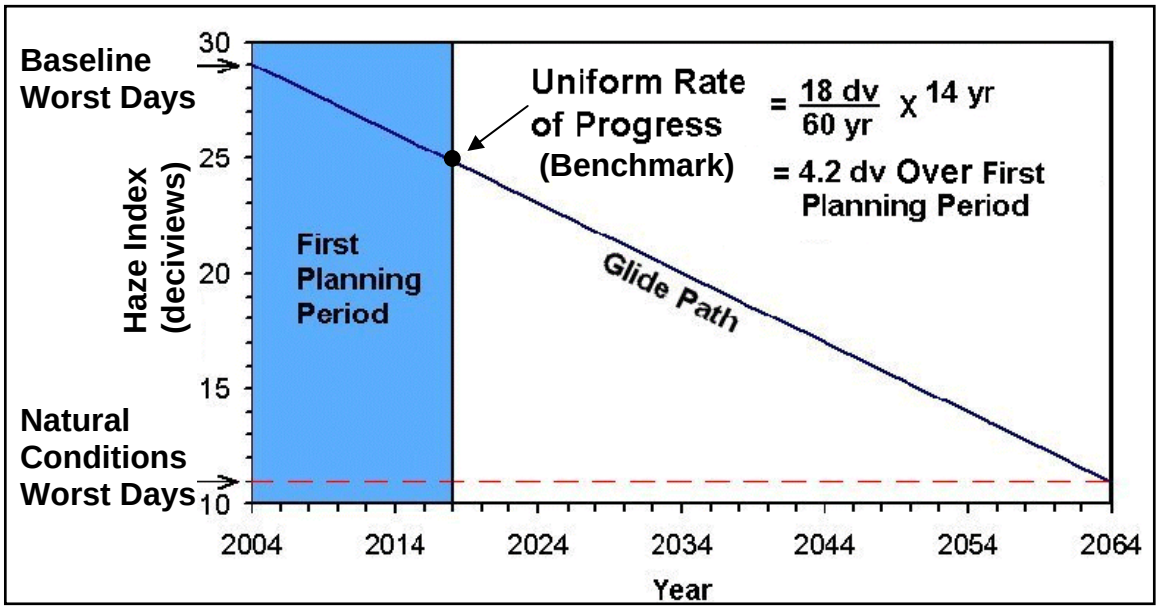
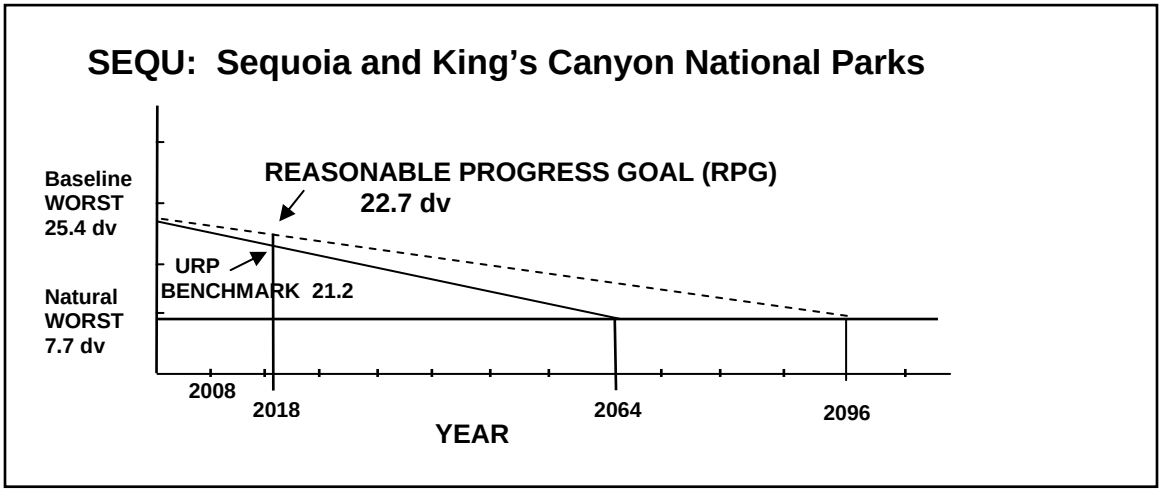


Figure 7.2 Example of Alternate Glide Path to Natural Conditions



The URP goals for each of the 17 IMPROVE monitors and their respective Class 1 Areas are included at the end of this Chapter in Table 7-2. Table 7-2 also provides an estimate of the number of years to achieve natural conditions if the current rate of progress were to continue. California makes progress towards the URP goals at all Class 1 Areas. Class 1 Areas in the Coastal and Southern California sub-regions make 51 percent to 94 percent progress towards the 2018 benchmark on the glide path, while Class 1 Areas in Northern California and the Sierra Nevada make 20 percent to 64 percent progress.

Past experience has shown that the path to cleaner air quality does not move in a straight line, although steady incremental improvements have been made in the past fifty years. Technological breakthroughs, changing land use patterns, the global economy, and climate change will affect the slope of the glide path in future planning periods beyond 2018. While no area meets the 2018 benchmark due to the influence of natural emissions from wildfires and biogenics, as well contributions from sources outside the WRAP region, each area makes significant progress and the rationale for the appropriateness of California's reasonable progress goals was provided earlier in this chapter.

To highlight the visibility improvement that will result from mobile source sector emission reductions, Table 7-1 shows 2018 modeled visibility progress from nitrate reductions. The 2018 nitrate modeled projections for 20 percent worst visibility days in most Class 1 Areas in California meet the 2018 URP benchmarks for nitrate except at San Gorgonio and Kaiser Wilderness Areas. In most Class 1 Areas, the 2018 nitrate modeled projection is even lower than the 2018 URP benchmark by up to 38 percent. At the San Gorgonio and Kaiser Wilderness Areas, the 2018 nitrate modeled projections fall short only 3 percent and 4 percent, respectively, of meeting the 2018 worst days URP benchmark. Nitrate is the haze component which comes primarily from NOx emissions within California. This analysis demonstrates that California's control program goes well beyond what is required.

As noted above, the WRAP analysis has indicated that sources not included in the WRAP region, such as from international shipping and emissions from Mexico and Asia, can provide substantial contributions to visibility impairment. Class 1 Areas nearest the Pacific Ocean are particularly impacted from offshore shipping emissions. California's Goods Movement Program targets reducing port and offshore emissions from sources that are under the Air Resources Board's regulatory control. However, given the expected growth in shipping activity, California is working with the federal government and international organizations to reduce the contributions to visibility impairment from these sources under federal and international control.

It also should be recognized that the URP for each Class 1 Area is based on the U.S. EPA calculated default natural visibility conditions. As stated previously, California, along with the western region, is researching what the definition of

natural conditions should be in order to better reflect the impact of biogenic emissions, wildfires, and global dust transport. An increase in 2064 natural condition levels would decrease the slope of the URP and therefore better align the progress that can be achieved from sources under the control of the western states with the glide path. At each mid-course review and with every 10-year Plan revision, the slope beyond 2018 will be re-evaluated based upon the monitoring data, new controls, and a better understanding of natural conditions.

Table 7-1 Modeled visibility progress from nitrate reduction with California's 2018 Progress Strategy

Class 1 Areas *WA=Wilderness Area* *NP=National Park* *NM=National Monument* *NS=National Seashore*	20 Percent Worst Haze Days Baseline (2000-04) (Mm-1)	20 Percent Worst Haze Days Benchmark for 2018 (Mm-1)	20 Percent Worst Haze Days Modeled Projection for 2018 (Mm-1)	Visibility Progress beyond Benchmark for 2018 (%)
NORTHERN CALIFORNIA				
Lava Beds NP South Warner WA	3.5	3.1	2.4	23
Lassen Volcanic NP Caribou WA Thousand Lakes WA	3.7	3.2	2.1	33
Marble Mountain WA Yolla Bolly-Middle Eel WA	6.1	5.1	3.6	29
SIERRA CALIFORNIA				
Desolation WA Mokelumne WA	2.4	2.0	1.7	16
Hoover WA	1.6	1.4	1.2	19
Yosemite NP Emigrant WA	8.1	6.2	5.3	15
Ansel Adams WA Kaiser WA John Muir WA	7.0	5.3	5.5	-3
Sequoia NP Kings Canyon NP	60.7	36.0	30.4	16
Dome Lands WA	16.0	11.2	8.5	24
SOUTHERN CALIFORNIA				
San Gabriel WA Cucamonga WA	27.7	18.4	16.1	12
San Gorgonio WA San Jacinto WA	44.9	27.7	28.8	-4
Joshua Tree WA	27.3	18.1	17.8	1
Agua Tibia WA	29.9	19.5	16.3	17
COASTAL CALIFORNIA				
Redwood NP	6.0	5.6	4.2	26
Point Reyes NS	38.4	24.2	21.2	12
Pinnacles WA Ventana WA	17.1	12.1	9.1	25
San Rafael WA	12.6	9.1	5.6	38

TSS Date: 4/2/2008

7.4 Conclusion

From a national perspective, California has gone well beyond national control levels in terms of reducing emissions. This enhanced level of control, along with the fact that natural and non-WRAP sources limit California's ability to meet the uniform glide path benchmark, support the selection of California's 2018 Progress Strategy as reasonable for setting RPGs for the Class 1 Areas within the State.

However, visibility protection must be viewed from the broader standpoint of all of the environmental protection efforts in California as we continue to reduce emissions and drive new technology development in the future. In 2007, due to the need to attain federal air quality standards for 8-hour ozone and PM2.5, ARB developed a comprehensive strategy of measures that target NOx, SOx, and diesel PM emissions. This strategy sets the framework for attaining the standards and provides for emission reductions through the 2023 timeframe.

In general, California has already tackled the easy to find emission reductions. The emission reductions in the 2007 Statewide Strategy target clean-up of in-use heavy duty trucks, off-road sources, and goods movement sources. ARB is proposing a comprehensive fleet modernization program that would be equivalent to the entire 2014 truck fleet meeting 2007 truck standards. ARB is requiring on-road mobile source technology be used on off-road sources. Meeting the federal standards in the South Coast and the San Joaquin Valley, the two regions with the most severe air quality problems, will require an 88 and 75 percent reduction in NOx emissions from 2006 levels, respectively. In addition, California is targeting the health impacts near our busy goods movement sectors. In 2006, ARB approved a *2006 Emission Reduction Plan for Ports and Goods Movement*. That Plan maps the strategies to reduce emissions near ports, railways, and transportation corridors and is an essential component of California's effort to reduce community exposure to air pollution.

In addition, in 2006, California passed legislation (AB 32) that established the first-in-the-world comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effective reductions of greenhouse gases. AB 32 requires the State to reduce greenhouse gas emissions to 1990 levels by 2020. California is required to have a plan for reaching this target by January 1, 2009. California will be evaluating many sectors including electricity, land use, oil and gas, transportation, cement facilities, agriculture, and waste management as to their impact on greenhouse gas emissions. Strategies to reduce greenhouse gas emission from these sectors will also provide reductions in other pollutants.

These future programs will provide further benefits in improving visibility throughout California. California will continue to revaluate progress and goals in the mid-course review time frame and in future planning periods. Since this is the first planning period, California anticipates more information regarding regional haze will be updated for each planning period including a better understanding of natural conditions, the impact of sources and controls, and new technology. California will examine these factors during the mid-course review and during development of future Plan revisions.

Table 7-2 Summary of Reasonable Progress Goal and Uniform Rate of Progress to Future Natural Conditions

California Class 1 Areas *(Visibility Calculated in Deciviews)*		**2018 Worst Days RPG**	**2018 Worst Days URP**	**2064 Natural Conditions Worst Day**	**Percent Progress by 2018 towards Natural Conditions**	**Future Date for Reaching Natural Conditions at Current Rate**	**Current Best Day Conditions**	**2018 Best Day Projection**
IMPROVE Monitor	**Class 1 Area(s)**							
NORTHERN CALIFORNIA								
TRIN *(1014 m.)*	Marble Mountain Wilderness Yolla Bolly-Middle Eel Wilderness	16.4	15.2	7.9	11%	2137	3.4	3.2
LABE *(1460 m.)*	Lava Beds National Monument South Warner Wilderness	14.4	13.4	7.9	10%	2148	3.2	3.0
LAVO *(1733 m.)*	Lassen Volcanic National Park Caribou Wilderness Thousand Lakes Wilderness	13.3	12.6	7.3	12%	2123	2.7	2.5
SIERRA CALIFORNIA								
BLIS *(2131 m.)*	Desolation Wilderness Mokelumne Wilderness	12.3	11.1	6.1	5%	2307	2.5	2.5
HOOV *(2561 m.)*	Hoover Wilderness	12.5	11.7	7.7	8%	2186	1.4	1.3
YOSE *(1603 m.)*	Yosemite National Park Emigrant Wilderness	16.7	15.3	7.6	9%	2160	3.4	3.2
KAIS *(2598 m.)*	Ansel Adams Wilderness Kaiser Wilderness John Muir Wilderness	14.9	13.6	7.1	7%	2200	2.3	2.1
SEQU *(519 m.)*	Sequoia National Park Kings Canyon National Park	22.7	21.2	7.7	15%	2096	8.8	8.1
DOME *(927 m.)*	Dome Lands Wilderness	18.1	16.6	7.5	11%	2132	5.1	4.7
COASTAL CALIFORNIA								
REDW *(244 m.)*	Redwood National Park	17.8	17.4	13.9	15%	2096	6.1	5.8
PORE *(97 m.)*	Point Reyes National Seashore	21.3	21.2	15.8	21%	2069	10.5	10.1
PINN *(302 m.)*	Pinnacles Wilderness Ventana Wilderness	16.7	16.0	8.0	17%	2086	8.9	8.1
RAFA *(957 m.)*	San Rafael Wilderness	17.3	16.2	7.6	13%	2109	6.4	5.8
SOUTHERN CALIFORNIA								
SAGA *(1791 m.)*	San Gabriel Wilderness Cucamonga Wilderness	17.4	16.9	7.0	19%	2076	4.8	4.1
SAGO *(1726 m.)*	San Gorgonio Wilderness San Jacinto Wilderness	19.9	18.7	7.3	15%	2095	5.4	5.0
AGTI *(508 m.)*	Agua Tibia Wilderness	21.6	19.8	7.6	12%	2121	9.6	8.9
JOSH *(1235 m.)*	Joshua Tree National Park	17.9	16.7	7.2	14%	2106	6.1	5.7